REMARKS

This Amendment is in response to the Office Action dated June 7, 2006. Claims 1-26 are presently pending. No new matter has been added.

§103 Rejections

Claims 1-6, 8-17 and 19-26 were rejected under 35 U.S.C. §103(a) as being unpatentable over Del Corno et al. Optics Letters, 15(13):734-736 ("Del Corno") in view of Il'ichev et al. Proceedings of Nonlinear Optics: Materials, Fundamentals, and Applications Topical Meeting, pp. 113-115 ("Il'ichev"). Claims 7 and 18 were rejected under 35 U.S.C. §103(a) as being unpatentable over Del Corno and Il'ichev in view of Bartschke et al., J. Opt. Soc. Am. B., 14(12):3452-3456 ("Bartschke"). The Applicant traverses these rejections.

Independent claims 1 and 13 recite a laser comprising a saturable absorber (SA) element arranged along a beam pathway and having an absorption recovery time which is longer than an output pulse duration. This describes a "slow" saturable absorber.

Del Corno does not teach or suggest a laser having a slow SA element. Del Corno's saturable absorber is a 1-mm thick dye cell (DC) which is a fast SA. In a fast SA element, the lifetime of the carriers in the SA element is less than the time required for laser energy to make a roundtrip of the cavity.

Il'ichev and Bartschke, on the other hand, are directed to lasers with slow saturable absorbers. As indicated in the present application, at page 3, line 20 to page 4, line 3, however, a slow SA typically can not passively mode-lock a laser to produce picosecond pulses because of the long absorption recovery time. The lasers of Il'ichev, and Bartschke are Q-switched and produce nanosecond, not picosecond, pulses.

There is no teaching or suggestion in any of these three references that a slow SA would be suitable for use in the Del Corno laser and would produce picosecond pulses. The Il'ichev and Bartschke lasers are substantially different in structure and operate on a different principle to produce nanosecond, not picosecond, pulses. Accordingly, there is no motivation in any of the cited references, Del Corno, Il'ichev, or Bartschke, to use the slow SA of Il'ichev or Bartschke in the laser of Del Corno. In fact, the present inventor received U.S. Patent No. 6,546,027 for the invention of a laser having a slow SA and a passive negative feedback element.

Moreover, Il'ichev shows, at best, that the orientation of the SA can affect the duration of the nanosecond pulses formed by the Q-switched laser of Il'ichev. There is no teaching or suggestion to one of skill in the art that the observations of Il'ichev would also apply to the picosecond pulses generated in the present laser. Such pulses are formed by a different mechanism than those generated in Il'ichev. The laser of the present claims produces an envelope of picosecond pulses, as illustrated in Figs. 4A-4C and 5A-5C of the present application. The envelope corresponds roughly to the nanosecond pulses of Il'ichev. At best, Il'ichev might suggest that the duration of the envelope would depend on SA orientation. But Il'ichev does not teach or suggest that duration of the picosecond pulses within the envelope would be dependent on SA orientation, as recited in the claims. None of the other cited references addresses these deficiencies of Il'ichev.

Thus, none of the prior art teaches or suggests all of the claim elements of claims 1 and 13. For at least these reasons, claims 1 and 13, as well as the remainder of the claims which depend therefrom, are patentable over the cited art. The Applicant respectfully requests withdrawal of these rejections of the claims.

In addition, with respect to claims 7 and 18, the Office Action cites Bartschke as teaching that "the placement of the SA relative to the active material can affect the output of the system." Claims 7 and 18 recited that "the location of the SA element can be selected to be one of a plurality of locations between the proximal reflective surface and the means for providing an energy output from the cavity." Bartschke does not teach or suggest this element.

Bartschke teaches that "the ratio of the pulse energies increased if the order of the two crystals was reversed; thus the Nd:YAB crystal is placed close to mirror M1 and the Cr^{4+}:YAG is close to M2." Thus, Bartschke teaches that a practitioner should place the crystals in this preferred orientation. Thus, Bartschke teaches away from selecting among a plurality of locations and instead teaches a particular placement of the SA in the laser. In short, Bartschke does not teach or suggest that a practitioner can choose between the two positions for the SA, but rather recommends only one position. None of the other references address this deficiency of Bartschke.

For at least this additional reason, claims 7 and 18 are patentable over the cited references. Accordingly, the Applicant requests withdrawal of the rejection of this claim.

Furthermore, claims 2 and 14 recite that the output pulse duration can be varied from about 20 picoseconds to about 200 picoseconds. The Office Action acknowledges that Del Corno teaches pulses in the 10-30 picosecond range, but asserts that "in combination with the pulse variance of Il'ichev [Del Corno] would allow for the obvious optimization of the claimed pulse duration ranges." It is not obvious, as indicated above, that the orientation dependence of Il'ichev would affect the picosecond pulses of Del Corno as the two lasers are substantially different and operate on different principles. Moreover, the spread of duration for the Il'ichev laser runs from approximately 20 to 220 nanoseconds, not picoseconds in Fig. 4b of Il'ichev.

In addition, claims 4 and 15 recite that the laser produces at least one output pulse having an energy of from about 100 μJ to about 2 mJ. The Office Action acknowledges that Del Corno teaches an output energy to be about 10 μJ, but asserts that "[i]t would have been obvious to one of ordinary skill in the art at the time of the invention to optimize the output power to a higher level...." The Applicant respectfully requests that, if this rejection is maintained, the next Office Action indicate how such optimization could be carried out to obtain at least a 10-fold increase in output power as recited in claims 4 and 15.

For at least these additional reasons, claims 2, 4, 14, and 15 are patentable over the cited references. The Applicant requests withdrawal of the rejection of these claims.

Claims 25 and 26 recite that the SA element is rotatably mounted in the cavity. This means that the SA element is mounted such that it can be rotated. The Office Action asserts that Il'ichev inherently teaches rotatable mounting because the SA is "either rotatable while mounted, or rotated and then mounted." The latter configuration is not rotatably mounted as the SA can not be rotated while mounted.

As indicated in M.P.E.P. §2112, [t]he fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic." In this instance, the Office Action has failed to establish the alleged inherent teaching because the SA of Il'ichev may not be rotatably mounted, but instead the SA may be manually rotated and then remounted for each angle. None of the other cited references address this deficiency of Il'ichev. For at least this additional reason, claims 25 and 26 are patentable over the cited references. Accordingly, the Applicant requests withdrawal of the rejection of these claims.

Double Patenting Rejection

Claims 1, 5, 10-13, 16 and 21-23 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1, 3, 7, 9, 14, 40-44 of U.S. Patent No. 6,546,027 in view of Il'ichev.

As indicated above, Il'ichev shows, at best, that the orientation of the SA can affect the duration of the nanosecond pulses formed by the Q-switched laser of Il'ichev. There is no teaching or suggestion to one of skill in the art that the observations of Il'ichev would also apply to the picosecond pulses generated in the present laser. Such pulses are formed by a different mechanism than those generated in Il'ichev. The laser of the present claims produces an envelope of picosecond pulses, as illustrated in Figs. 4A-4C and 5A-5C of the present application. The envelope corresponds roughly to the nanosecond pulses of Il'ichev. At best, Il'ichev might suggest that the duration of the envelope would depend on SA orientation. But Il'ichev does not teach or suggest that duration of the picosecond pulses within the envelope would be dependent on SA

orientation, as recited in the claims. None of the other cited references addresses these deficiencies of Il'ichev.

For at least these reasons, the claims are not obvious over the cited references. The Applicant respectfully requests withdrawal of this rejection of claims 1, 5, 10-13, 16 and 21-23.

CONCLUSION

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to pass this application to issue.

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Respectfully submitted,

By _____

Bruce E. Black, Ph.D.
Registration No.: 41,622
DARBY & DARBY P.C.
P.O. Box 5257
New York, New York 10150-5257
(206) 262-8900
(212) 527-7701 (Fax)
Attorneys/Agents For Applicant